

# **Nutrition Assessment in Renal Disorders**

By

Dr Olfat Abdelhalim

Clinical Nutrition Consultant

# Outline

- Introduction
- Protein energy malnutrition (PEM)
- Nutrition assessment
  - Dietary Assessment
  - Clinical Assessment
  - Laboratory Interpretation

**1- One of the best validated screening indicators for malnutrition risk is:**

A- Patient reports a non-volitional weight loss of 10% of usual body weight

B- Patient is following a low CHO weight loss diet

C- Patient is 2 days post-laparoscopic cholecystectomy

D- Patient reports a recent flu-like febrile illness

**2- A patient has reduced albumin of 2.8 g/dl, this means that the patient is malnourished? Answer of this question include all of the following except:**

A- The patient's protein intake must be inadequate & he should receive prompt nutrition support

B- Evaluation of clinical & lab signs of inflammatory response would be helpful in diagnosis

C- Review the medical history & clinical diagnosis may help to know whether inflammatory response &/or malnutrition are likely to be present

D- Additional evidence as loss of body cell mass or decreased food intake are needed to diagnose a malnutrition syndrome

# Introduction

- Various nutrition surveys in hospitals estimated that nearly **40% to 50%** of patients, particularly those in the ICU, have a moderate to severe degree of malnutrition, with its significant negative impact on clinical outcomes.
- Approximately **40 to 70 %** of patients with end-stage renal disease (ESRD) are malnourished.

(INTERNATIONAL ANESTHESIOLOGY CLINICS 2009)

- Malnutrition develops during the course of CKD
- Low protein and calorie intake is an important cause of malnutrition in CKD.
- PEM is characterized by the insidious loss of body fat and somatic protein stores, diminished serum protein concentrations, and poor performance status and function
- ***Malnutrition is associated with worse outcomes in CKD***

***The onset and severity of PEM is related to the level of GFR;  
GFR < 60 mL/min/1.73 m<sup>2</sup>,  
- Higher prevalence of impaired nutritional status  
- Albumin begins to decline***

# Malnutrition

**Over**  

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**Under**

**Experts define malnutrition as:**

“An acute, subacute or chronic state of nutrition, in which varying degrees of overnutrition or undernutrition with or without inflammatory activity have led to a change in body composition and diminished function.”

The New Malnutrition



False Weights

(A.S.P.E.N. Board of Directors 2010)



- PEM is defined as inadequate intake of energy and protein to meet bodily needs & characterized by weight loss and loss of muscle tissue.

# Classification of Malnutrition

## 1- Starvation-associated malnutrition

(e.g, anorexia nervosa, major depression)

## 2- Chronic disease-associated malnutrition

When inflammation is chronic and of mild to moderate degree (eg, organ failure, pancreatic cancer, rheumatoid arthritis)

## 3- Acute disease or injury-associated malnutrition

When inflammation is acute and of severe degree (e.g, major infection, burns, trauma)




*(J Parenter Enteral Nutr 2012)*

# Diagnosis of Malnutrition

- Identification of **2** or more of the following 6 characteristics is recommended :
  - Insufficient energy intake
  - Weight loss
  - Loss of muscle mass
  - Loss of subcutaneous fat
  - Localized or generalized fluid accumulation that may sometimes mask weight loss
  - Diminished functional status as measured by handgrip strength

*(J Parenter Enteral Nutr. 2009)*

- Inflammation and related compensatory mechanisms associated with disease or injury may cause:
  - Anorexia
  - Alterations in body composition
  - Stress metabolism.
- Metabolic alterations associated with inflammation are predominantly cytokine mediated and persist as long as the inflammatory stimulus is present.



- These metabolic alterations include:
  -  Energy expenditure
  - Lean tissue catabolism (proteolysis)
  - Fluid shift to the EC compartment
  - Acute phase protein changes
  - Hyperglycemia.
-  Synthesis of **Negative acute phase proteins** will result in reduced serum albumin, transferrin, pre-albumin & RBP
-  **Positive acute phase proteins** such as C-reactive protein which are also potent predictors of morbidity and mortality

# Conditions Associated With Development of Protein-Energy Malnutrition

- Catabolic illness: the stress response (e.g trauma, surgery, wounds, infection, corticosteroids)
- Involuntary weight loss ( $> 10\%$  )
- Chronic illness (e.g DM, cancer, CKD)
- Increased nutritional losses from intestinal disease, surgery
- Intestinal tract diseases impairing absorption

Higher incidence of PEM in patients with chronic non-healing wound.

# High-Risk Population for PEM and Impaired Healing

- The most common precipitating cause of PEM is an acute injury or illness leading to a "stress response".
- This abnormal metabolic response is aggravated by an  in catecholamines, cortisol & glucagon and  in anabolic hormones, testosterone, and growth hormone.
- 20% to 30% of body protein is used for gluconeogenesis during the "stress response," leading to a rapid loss of LBM.

# Causes of Malnutrition in CKD

- Anorexia & poor food intake
- Hormonal disturbances
- Nausea and vomiting
- Restrictive diets
- Medications
- Nutrient losses (vomiting, diarrhea and GIT bleeding)
- Many of the illnesses that lead to CKD can induce a catabolic state that contributes to protein losses

*(Annual Review of Nutrition 2001)*

*(Modern Nutrition in Health and Disease 2006)*

*(Understanding Basic and Clinical Nutrition 2010)*



# Markers of PE Malnutrition

- The optimal monitoring of nutritional status needs the collective evaluation of multiple parameters (i.e, assessment of visceral protein, muscle mass or somatic protein, body composition).
- Serum albumin, pre-albumin & transferrin levels are used to measure visceral protein.
- Anthropometry & DEXA assess somatic protein and fat
- Edema-free weight, body mass index (BMI), and subjective global assessment (SGA) are valid and clinically useful tools for overall nutritional assessment.

# Biochemical Markers of PEM

## Defining Severity

### (Transport Proteins)

Protein	Normal value	Half Life T <sub>1/2</sub>	Mild	Mod	Severe
Albumin	3.5-5.0 g/dL	21 Days	2.8-3.5	2.1-2.7	< 2.1
Pre-albumin (transthyretin)	10-40 mg/dL	2-3 Days	10-15	5-10	<5
Transferrin	200-400 mg/dl	8 Days	150- 200	100- 150	<100
Retinol-binding protein	2.7-7.6 mg/dL	10 hours	4-6	2-4	<2

Contrary to popular belief, hypo-albuminemia is rarely present in cases of isolated calorie malnutrition

***“S. Albumin is recommended for routine measurement in renal patients & is considered a true marker of visceral protein metabolism when there is no evidence of any disorder that cause inflammation or change in albumin metabolism & it has a relation with the outcome & mortality”***

***“Transferrin concentration is best used state of circulating iron & can’t be reliably interpreted as a marker of nutritional status except when there is no evidence of inflammation or iron deficiency”***

*“CRP is useful in defining the presence of inflammation that would adversely affect the nutritional status  
A normal CRP has no relation to normal nutritional status”*

***“Serum creatinine is reflective of patient’s skeletal muscle mass (in absence of rhabdomyolysis & m injury) & can suggest longstanding malnutrition but consider the age & sex in interpretation “***

- Studies show that uremic acidosis causes an increase in protein degradation.
- Correction of acidosis is accompanied by a decrease in protein tissue breakdown
- Serum bicarbonate concentration as a measure of acid-base balance, has been used to assess malnutrition in CKD.
- Low serum bicarbonate has been correlated to low serum albumin.
- Hyper-P, hyper-K, and metabolic acidosis may develop during CKD.

# Medical Nutrition Therapy

- Medical nutrition therapy involves the **assessment** of the nutritional status of patients with a condition, illness, or injury that puts them at risk.
- This includes review and analysis of medical and diet history, laboratory values & anthropometric data.
- Based on the assessment, **nutrition modalities** most appropriate to manage the condition or treat the illness or injury are chosen and include the following:



- 1- Diet modification, counseling, and education leading to the development of a personal diet plan to achieve nutritional goals and desired health outcomes
- 2- Specialized nutrition therapies including:
  - Supplementation with medical foods
  - EN for those unable to ingest or digest food
  - TPN for those unable to absorb nutrients

# Nutrition Screening

## Definition:

- “a process to identify an individual who is malnourished or who is at risk for malnutrition to determine if a detailed nutrition assessment is indicated.”
- In the USA, the JCI mandates nutrition screening within 24 hours of admission.
- There is no single screening method that is universally accepted, institutions can develop specific techniques that meet their particular needs.

# Screening Tools

- Malnutrition Universal Screening Tool (MUST)
- Nutritional Risk Screening 2002 (NRS)
- Mini Nutritional Assessment<sup>®</sup>, Short (MNA)
- Nutritional Assessment Questionnaire©
- Subjective Global Assessment (SGA)

# Nutrition Assessment

## Definition:

“a comprehensive approach to diagnosing nutrition problems that uses a combination of the following: medical, nutrition, and medication histories; physical examination; anthropometric measurements; and laboratory data.”

- A nutrition assessment provides the basis for a nutrition intervention.

(Journal of Parenteral and Enteral Nutrition 2011)

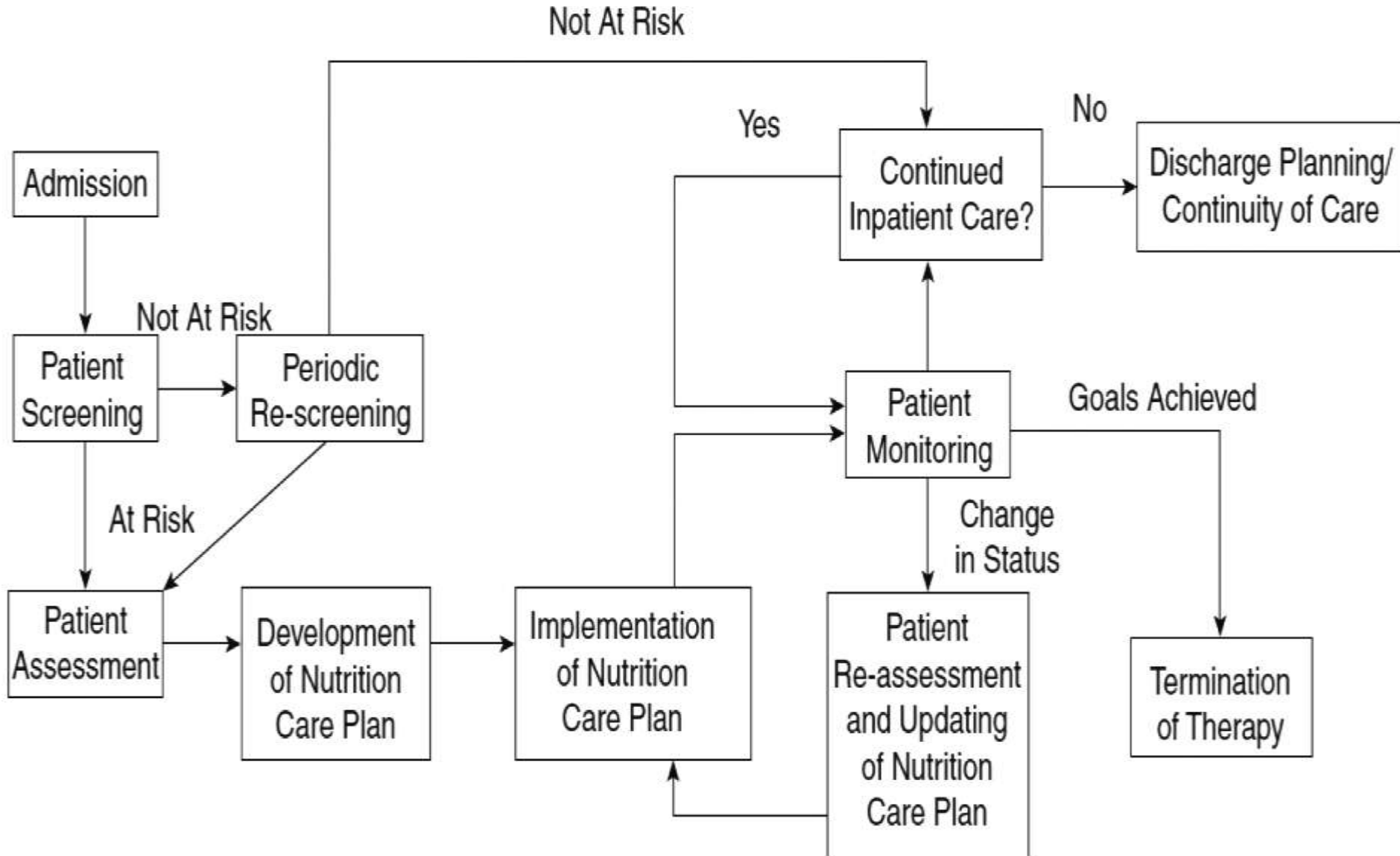
# Nutrition Assessment

- Nutrition assessment is necessary to determine the appropriateness of the nutrition support regimen & response to therapy
- The causes of renal disorders & any associated complications should be noted
- Medications must be evaluated for nephrotoxicity or renal clearance
- Combination of anthropometry & lab are useful to establish the severity of malnutrition

# **Nutrition Care Process (NCP)**

- 1. Nutrition Assessment**
- 2. Nutrition Diagnosis**
- 3. Nutrition Intervention (plan/education)**
- 4. Nutrition Monitoring and Evaluation**

# Nutrition Care Algorithm



*(Nutr Clin Pract. 2010)*

Nutrition intervention in malnourished patients was associated with improved nutrition status, nutrient intake, physical function, and quality of life. In addition, hospital readmissions were reduced

**(A.S.P.E.N. Clinical Guidelines 2011)**



# How we can nutritionally assess any patient?

- Dietary intake
- Anthropometric measures
- SGA
- Laboratory work

## **A systematic approach for assessment include:**

- *History and clinical diagnosis***
- *Clinical signs and physical examination***
- *Dietary data* (24-hour recall)**
- *Anthropometric data***
- *Laboratory indicators***
- *Functional outcomes* (strength & performance)**

# *History and Clinical Diagnosis*

- Raising concern for inflammation and malnutrition
- Weight loss is the best validated nutrition assessment parameter
- 5 % over a 30-day period
- 10% loss over the preceding 6 months is the standard definition for weight loss producing a significant health risk.
- Severe loss of 30% of body weight over the 6 months is life-threatening.

- Diseases characterized by severe acute inflammatory response: critical illness, major infection/sepsis, ADRS, SIRS, severe burns, major abdominal surgery, multi-trauma.
- Diseases associated with mild to moderate chronic inflammatory response: IBD, celiac disease, chronic pancreatitis, rheumatoid arthritis, solid tumors, DM, organ failure
- Such diseases may contribute to malnutrition by increasing nutrition requirements or compromising intake
- Review of medications for potential food –drug interaction.

# Clinical Signs and Physical Examination

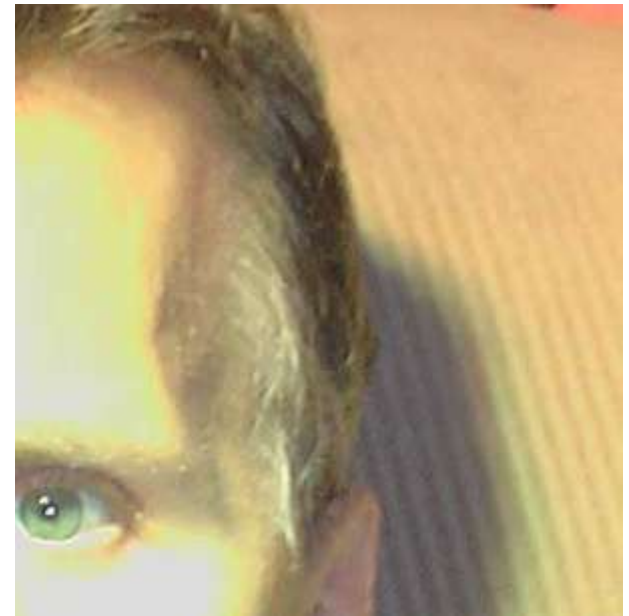
- Fever, hypothermia, and tachycardia are nonspecific clinical indicators of inflammation.
- Look at the following:
  - Edema (wt. loss is not appreciated)
  - Signs of wt. gain or wt. loss
  - Specific nutrient deficiencies
  - Parts of the body with high cell turnover (e.g, hair, skin, mouth, tongue)
  - Loss of S.C fat & muscle wasting

# **Nutrition Focused Physical Exam.**

- A systems approach is used when performing the examination, which should be conducted in an organized, logical way that progresses from head to toe to ensure efficiency
- Exam is tailored for each patient, every body system may not have to be assessed in all people; clinical judgment guides the decision
- Inspection, palpation, percussion, auscultation

# Signs of Malnutrition

- Temporal wasting, proximal muscle weakness, depleted muscle bulk, dehydration, poor wound healing, and chewing or swallowing difficulties.
- Areas where signs of nutritional deficiencies appear (skin, hair, gums, lips, tongue, eyes)
- Mucosal changes in the GIT are indicated by problems such as diarrhea and anorexia.



# Clinical Assessment of Fluid Status

Parameter	Deficit Fluids	Excess fluids
Blood Pressure	Decreased	Increased
BUN/Creatinine	Increased	Decreased
<b>CVP</b>	Decreased	Increased
Edema	-	Yes
Electrolyte Abnormalities	Increased Na <sup>+</sup> , Cl <sup>-</sup>	Decreased Na <sup>+</sup> , Cl
<b>Eyes</b>	Sunken	Puffy (eyelids)
<b>Neck veins</b>	Flat	Distended
Heart Rate	Increased	-
<b>Skin</b>	Poor turgor	Moist
Hb/ Hct	Increased	Decreased
<b>Intake / Output</b>	Output > Intake	Intake > Output
<b>Weight</b>	Decreased	Increased
Urine Specific gravity	Increased	Decreased



# Diet Assessment

- The purpose of the dietary assessment is to obtain relevant information from the current diet to identify dietary components that may raise or lower health risks.
- Also consider the physical ability to digest food, food intolerances, taste changes
- **Tools:**
  - 24-Hour dietary recall
  - Food frequency questionnaire (1 m)
  - Food diary (3 d)

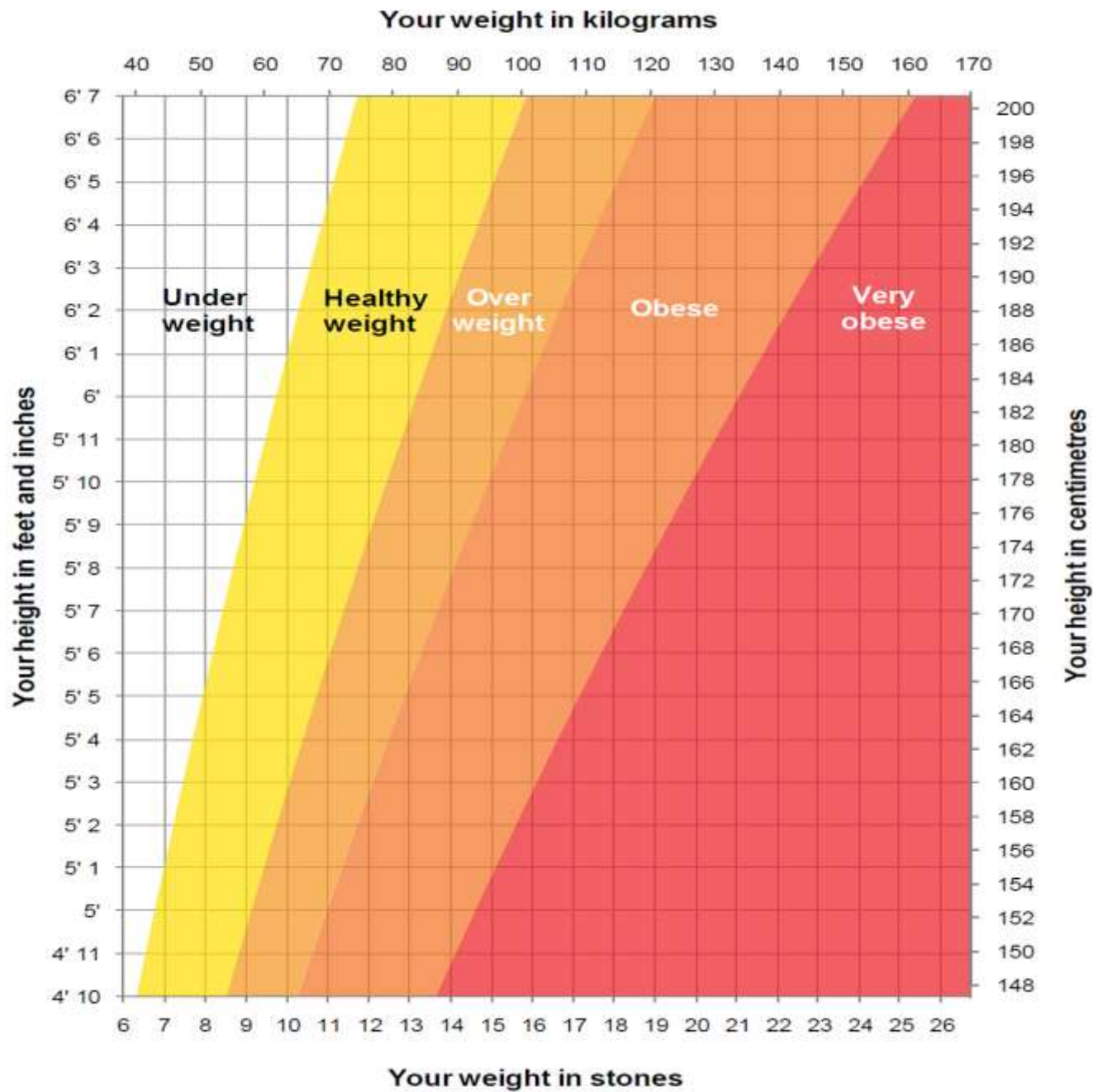
- **Dietary Assessment including:**
  - Need for adaptive feeding aids
  - Adequacy of intake
  - Appetite / taste changes
  - Chewing/swallowing ability
  - Cultural/ethnic considerations
  - Dietary restrictions
  - Eating patterns
  - Food intolerances/allergies
  - Hydration status including fluid intake

# **Anthropometric Measures**

# *Anthropometric data*

- Includes: wt, ht, BMI and size as skin-fold thicknesses, circumferences
- Anthropometry is a key component of assessment
- Repeated weight over time is recommended to monitor weight change trends
- Adults who cannot safely stand, height can be estimated by alternative methods





# Subjective Global Assessment (SGA)

## 1- History

- Weight changes
- Dietary intake changes
- GIT Symptoms
- Functional capacity
- Disease & its relation to nutritional requirements

# SGA (cont.)

## 2- Physical Exam.

- Loss of subcutaneous fat (triceps, chest)
- Muscle wasting (quadriceps, deltoids)
- Ankle edema
- Sacral edema
- Ascites

# SGA (cont.)

## SGA rating

- A = Well nourished
- B = Moderately (or suspected of being) malnourished
- C = Severely malnourished



# Lab assessment

- Fasting lipid profile.
- Blood glucose, glycosylated hemoglobin (A1C),
- C-reactive protein
- C.B.C
- Albumin, prealbumin (response to MNT)
- Liver & renal function
- Electrolytes

No single clinical or lab parameter can be recommended as an indicator of comprehensive nutritional status



# Nutrition Assessment & Monitoring in Renal Failure

- Medical history
- Dietary history: Diet recall
- Anthropometrics : wt (dry, usual), Ht
- Medications

- Physical Exam:
  - General appearance
  - Blood pressure
  - Fluid status
  - Signs of nutritional deficiency
  - Diminished fat stores

- Nitrogen status
  - Albumin
  - Urinary nitrogen
  - Appearance (UNA)
- Renal functions
  - BUN
  - Creatinine
  - Creatinine clearance([www.kidney.org](http://www.kidney.org))

- Laboratory measures
  - Electrolytes: Na, K, Cl, HCO<sub>3</sub>
  - Minerals: Ca, P, Mg
  - Glucose
  - Cholesterol/ TG
  - CBC

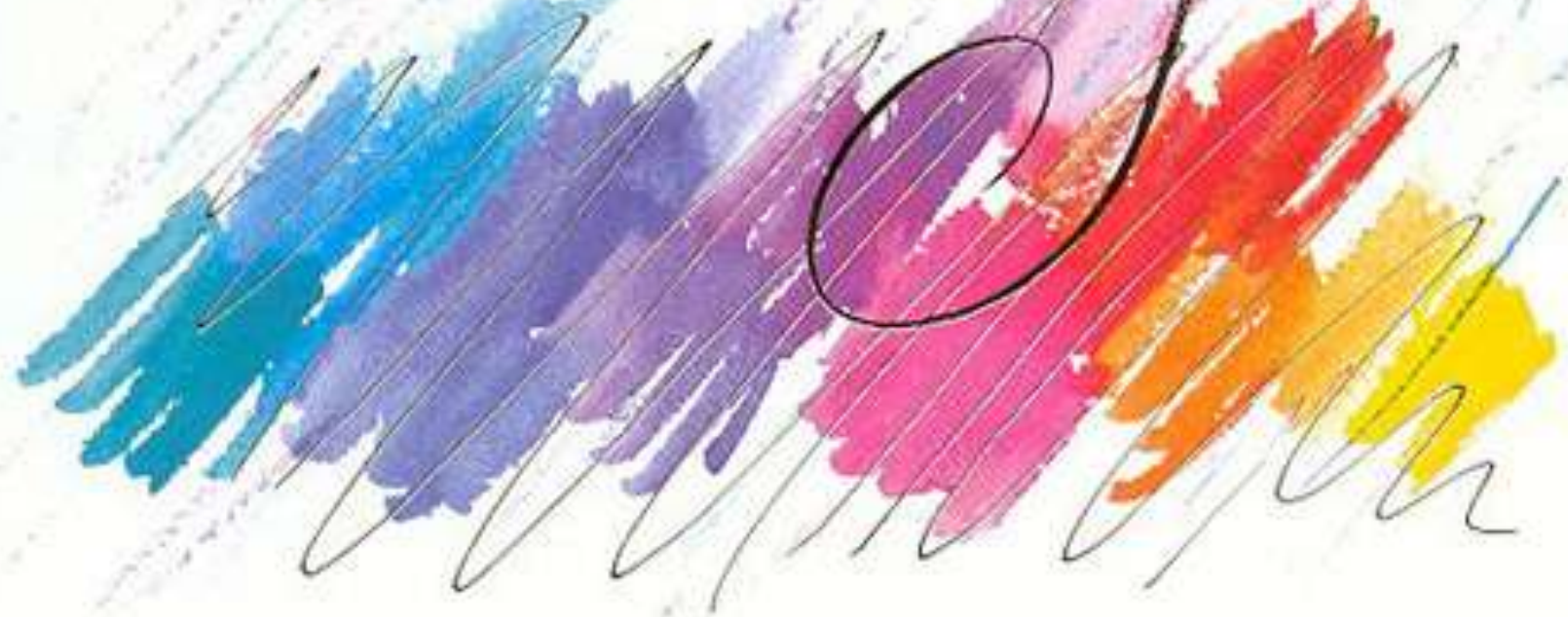
# Take Home Massage

- Up to 50% of hospitalized patients & up to 70% of ESRD patients are malnourished.
- The periodic assessment of nutritional status should be part of the routine care of renal patients to permit early recognition and the institution of appropriate therapy.
- Nutrition care process include:
  - 1. Nutrition Assessment**
  - 2. Nutrition Diagnosis**
  - 3. Nutrition Intervention**
  - 4. Nutrition Monitoring & Evaluation**

There is no single measurement that can be used to diagnose malnutrition but systematic approach should be carried out including:

- ***History and clinical diagnosis***
  - ***Clinical signs and physical examination***
  - ***Dietary data***
  - ***Anthropometric data***
  - ***Laboratory indicators***
  - ***Functional outcomes***
- Nutritional intervention improved the overall outcome in patients with different renal disorders.

Thank You!



# Case 1 What is the SGA rating?

- A 65-yr-old man was admitted to hospital for resection of a suspected esophageal carcinoma
- He had been well until 4 months prior to admission, when he began to notice the onset of dysphagia. The dysphagia progressed rapidly to the point where he could no longer swallow.
- He had lost 12% of his body weight in the previous 4 months, and was continuing to lose weight.
- He was ambulatory but felt weak, and was no longer able to continue some of his usual daily activities.
- There was no fever, significant nausea, vomiting, or diarrhea.
- On physical examination, the man appeared to be wasted.
- There was obvious subcutaneous tissue loss in the triceps and thoracic regions. There was clear muscle wasting in the deltoids and quadriceps. There was trace edema in the ankles and no ascites.

“Education is the  
most powerful  
weapon which you  
can use to change  
the world.”

- Nelson Mandela

